REMARKS

Reconsideration of this application, based on this amendment and these following remarks, is respectfully requested.

Claims 18 through 68 remain in this case. Claim 63 is amended. Claims 1 through 17 were previously canceled.

Applicants note the allowance of claims 18 through 62.[1]

Claims 63 through 68 were rejected under §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Specifically, the Examiner found that the terms "the weighted complex amplitudes" and "the pseudo-random sequence" lacked antecedent basis.

Claim 63 is amended to overcome the rejection. The word "weighted" is canceled in line 7, and the word "pseudo-random" is canceled in claim 17. The terms modified by those canceled words, "complex amplitudes" and "sequence", respectively, clearly have antecedent basis in claim 63.

Claim 63 is also amended for clarity, by striking the word "are" in line 13. No new matter is presented.

Applicants respectfully submit that this amendment to claim 63 is sufficient to overcome the §112 rejection. Reconsideration is requested.

Claims 63 through 68 were rejected under §103 as unpatentable over the Jasper et al. reference[2] in view of the Cioffi et al. reference[3]. Relative to claim 63, the Examiner found that the Jasper et al. reference taught all of the steps and limitations of claim 63, except for the particular synchronizing pattern recited in the claim, which the Examiner found to be taught by

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[1] Office Action of November 1, 2007, page 6.

[2] U.S. Patent No. 5,343,499, issued August 30, 1994 to Jasper et al., from an application filed January 9, 1992.

[3] Cioffi et al., "Modification to DMT Synchronization Pattern Insertion", Submission T1E1.4/93-089 to the T1E1.4 Working Group of Committee T1.

the Cioffi et al. reference. The Examiner found that it would have been obvious to use the synchronizing pattern of the Cioffi et al. reference in the method disclosed by the Jasper et al. reference, in order to meet the standard described by the Cioffi et al. reference.

Applicants respectfully traverse the §103 rejection of claims 63 through 68, on the grounds that the combined teachings of the applied references fall short of the requirements of the claims.

In making this traversal of the rejection, Applicants will be assuming, for the sake of argument only, that the Cioffi et al. reference is in fact prior art to the claims in this application. However, by making this argument, Applicants are not acquiescing to the conclusion that the Cioffi et al. reference is in fact prior art to the claims in this case. As stated in the Preliminary Amendment filed in this application on January 14, 2004, while the Cioffi et al. reference bears a date that is earlier than one year before the priority date of this application, the assignee of this application cannot determine with certainty whether copies of the Cioffi et al. reference were provided or made available to the attendees of the Working Group meeting to which the submission corresponding to this reference was made, and cannot determine with certainty whether an oral presentation of the subject matter of the Cioffi et al. reference was made in that meeting. Accordingly, Applicants submit that the facts of record at this time do not establish that the Cioffi et al. reference is prior art to the claims in this application. However, in the spirit of completely and fully complying with the duty of candor and good faith in this application, and completely and fully serving the public interest by ensuring that the Patent and Trademark Office is fully aware of and can evaluate the teachings of all information material to patentability of the claims in this application, and in order to advance the prosecution of this application, Applicants traverse the §103 rejection of claims 63 through 68 assuming, for the sake of argument only, that the Cioffi et al. reference can be applied against the claims.

Applicants submit that the combined teachings of the applied references fall short of the requirements of claim 63, because neither reference teaches the step of correlating the complex amplitudes, corresponding to the received values of the synchronizing frame, with corresponding stored values of the synchronizing pattern, weighted by a weighting coefficient for each of the plurality of tones. Contrary to the assertion of the Examiner, the Jasper et al. reference fails to

disclose the weighting of such correlations in the manner required by the claim, while the Cioffi et al. reference was not asserted as providing such teachings and in fact does not so teach.

In order to determine whether the teachings of the Jasper et al. reference referring to a weighted average teach the weighted correlations of claim 63, one must ask and answer these questions:

> 1. *What* is weighted according to the Jasper et al. reference? Is it a correlation of a complex amplitude with a corresponding stored value of a synchronizing pattern, as claimed, that is taught by the reference?
>
> 2. What do the weighting factors of the Jasper et al. reference *correspond to*? Do these weighting factors correspond to weighting coefficients for each of a plurality of tones as claimed?

If the answer to the second part of either of these questions is "no", then the Jasper et al. reference does not teach the correlating step of claim 63. And Applicants submit that the answer to the second part of *both* of these questions is "no".

Regarding the first question, Applicants submit that the Jasper et al. reference teaches the weighting of a phase angle difference between temporally adjacent synchronizing symbols, and therefore does not teach the correlation of a complex amplitude with a corresponding stored value of a synchronizing pattern, as claimed. The portion of the Jasper et al. reference cited by the Examiner teaches two alternative methods for determining a weighted average.[4] The cited portion of the reference relative to this first alternative method reads:

> After forming the **weighted average**, the resultant is divided by by a factor equal to $2\pi T$, producing a frequency error signal, where T is the time between successive synchronizing vectors in the subchannel, and where phase angles are in radians. The result of this operation is an estimate of the frequency offset between the receiver and transmitter. This estimated frequency offset may be further filtered to produce an AFC control signal. [5]

However, we must look to earlier passages in the Jasper et al. reference to determine just what this "weighted average" is:

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[4] Jasper, *supra,* column 10, lines 7 through 43.

[5] Jasper, *supra,* column 10, lines 7 through 15 (emphasis added).

> For all successive samples of synchronizing symbols, calculate **a series of numbers equal to the difference in actual phase angle, between pairs of temporally adjacent synchronizing vectors,** x_{ij} . (Where i=1 to 4 for a four subchannel QAM system and where j=1 to n, where n is the number of sync symbols.)
>
> For each of said N QAM subchannels, there is an expected phase angle difference between synchronizing symbols. The receiver will normally know this expected phase angle difference in advance. The method of generating an AFC control signal generation requires that for each of said N QAM subchannels, **the expected phase angle difference between successive synchronizing vectors, S_{ij}, should be subtracted from the actual phase angle difference between temporally adjacent synchronizing vector samples, x_{ij} , forming thereby a series of numbers representing phase angle errors**. (If the f_0 frequencies of the transmitter and receiver were identical, the actual phase angle differences would be equal to the expected phase angle differences. Since the f_0's are likely to be different, there will be angular differences other than the expected values.)
>
> The series of numbers obtained from this previous step is operated upon to form a **weighted average phase angle**. In the preferred embodiment, each of the differences forming this series was multiplied by a scalar value proportional to the product of the amplitudes of the temporally adjacent sync symbols x_{ij} .[6]

According to this disclosed first alternative method, according to the Jasper et al. reference, the "weighted average" that is produced is clearly a weighted average *phase angle*, from a sequence phase angle difference values between successive synchronizing vectors, subtracted from actual phase angle differences between temporally adjacent synchronizing vector samples.

The second disclosed alternative method in the Jasper et al. reference is described in the remainder of the cited portion of the reference:

> An alternative method of generating a **weighted average phase angle** is shown in FIG. 12 and reproduced in part below. Herein, each synchronizing symbol vector x_{ij} is multiplied by a quantity equal to the complex conjugate of the previous synchronizing vector $x_{i,j-1}$. Each of these vector products is rotated by the negative of the expected phase angle difference between the corresponding sync symbols, S_{ij} and $S_{i,j-1}$, forming another vector. A sum of all these vectors, for all sync symbols and for all subchannels is formed. The phase of this resultant vector (y) is the **weighted average phase angle**.

[6] Jasper et al., *supra,* column 9, line 47 through column 10, line 6 (emphasis added).

$$y = \sum_{i=1}^{4} \sum_{j=2}^{n} \left(\frac{x(i,j)x^*(i,j-1)}{e^{jarg\,[S(i,j)S^*(i,j-1)]}} \right)$$

where i is the number of subchannel; j is the synchronizing vector number;

n is the number of sync vectors per subchannel;

x(i,j) is the j'th synchronizing vector sample in QAM subchannel i;

x* is the complex conjugate of the vector x;

e^{jarg} [S(i,j)S*(i,j-1)] is a unit amplitude vector, the phase of which is the expected angle between synchronizing vectors;[7]

Again, this portion of the Jasper et al. reference clearly describes the generation of a "weighted average phase angle". This is consistent with the first alternative method described in the Jasper et al. reference, as one would expect.

Therefore, to the question "What is weighted according to the Jasper et al. reference?", the answer is: "a phase angle". Specifically, the Jasper et al. reference teaches the weighting of each of a series of numbers, each number being the result of the subtraction of an "expected phase angle difference between successive synchronizing vectors" from an "actual phase angle difference between temporally adjacent synchronizing vector samples".[8] Applicants submit that these phase angle differences[9] cannot correspond to correlations of complex amplitudes with corresponding stored values of the synchronizing pattern, as required by claim 63. This is evident, on at least a fundamental level, because the Jasper et al. reference is weighting phase angles, while claim 63 is correlating amplitudes.

The values being weighted according to the Jasper et al. reference thus do not correspond to those being weighted according to claim 63. In the discussion above, therefore, the second part of posed question 1 is thus "no", and the Jasper et al. reference falls short of the claims in this regard.

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[7] Jasper et al., *supra,* column 10, lines 16 through 43 (emphasis added).
[8] Jasper et al., *supra,* column 9, line 56 through column 10, line 6.
[9] Each phase angle difference of the reference actually being a difference of differences.

Regarding the second question posed above, the weighting factors taught by the Jasper et al. reference do not correspond to a weighting coefficient for each of the plurality of tones, as required by the claim. The Jasper et al. reference is especially explicit regarding the derivation of its weighting factors:

> The series of numbers obtained from this previous step is operated upon to form a weighted average phase angle. In the preferred embodiment, each of the differences forming this series was multiplied by **a scalar value proportional to the product of the amplitudes of the temporally adjacent sync symbols x_{ij}**.[10]

in the first alternative method disclosed by the Jasper et al. reference. The weighting of the phase angle difference by the amplitudes of the temporally adjacent synchronizing symbol vectors is also present in its second disclosed alternative method:

> An alternative method of generating a weighted average phase angle is shown in FIG. 12 and reproduced in part below. Herein, **each synchronizing symbol vector x_{ij} is multiplied by a quantity equal to the complex conjugate of the previous synchronizing vector $x_{i,j-1}$.** Each of these vector products is rotated by the negative of the expected phase angle difference between the corresponding sync symbols, S_{ij} and $S_{i,j-1}$, forming another vector. A sum of all these vectors, for all sync symbols and for all subchannels is formed. The phase of this resultant vector (y) is the weighted average phase angle.[11]

Therefore, according to the Jasper et al. reference, the weighting factors correspond to a product of amplitudes of temporally adjacent symbols.

The second part of question 2 posed above therefore must also be "no". The weighting coefficients that weight the correlations of the correlating step, of claim 63, are "a weighting coefficient for each of the plurality of tones". In other words, the weighting coefficients of claim 63 are each defined by their corresponding tone in the multicarrier modulated signal.[12] This is clearly not the case for the Jasper et al. reference. Rather, according to the reference, the weighting factors correspond to a product of amplitudes of temporally adjacent symbols, as described above.

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[10] Jasper et al., *supra,* column 10, lines 1 through 6 (emphasis added).
[11] Jasper et al., *supra,* column 10, lines 16 through 27 (emphasis added).
[12] See also dependent claims 65 through 68, and the discussion below regarding those claims.

For these reasons, Applicants submit that the Jasper et al. reference does not teach the correlating step of claim 63, because the reference does not teach correlations that are weighted by weighting coefficients, nor does it teach weighting anything with a weighting coefficient for each of the plurality of tones, both as required by the claim. And because the Cioffi et al. reference also fails to disclose this weighting, Applicants submit that the combined teachings of the applied references fall short of the requirements of the claims.

Furthermore, Applicants submit that there is no suggestion or motivation from the prior art to modify these teachings to reach claim 63, nor would the skilled artisan using ordinary creativity arrive at the method of claim 63 from the applied references. There is simply nothing from either of the references that would lead the skilled reader to weight complex amplitudes corresponding to received synchronizing frame values, correlated with the synchronizing pattern, on a tone-by-tone basis as results from the method of claim 63. This lack of suggestion is especially evident from the Jasper et al. reference, in which there is simply no mention of weighting any correlations by tone – only weighting by a product of amplitudes of adjacent QAM symbols from which the phase angle differences are derived.

For these reasons, Applicants submit that claim 63 and its dependent claims are patentably distinct over the applied references. The §103 rejection of these claims is therefore respectfully traversed.

Claim 65 further requires, relative to claim 63 on which it depends, that each weighting coefficient corresponds to whether its associated tone is to contribute to the comparison result. Claim 66 further requires, relative to claim 65 upon which it depends, that the weighting coefficient applied to a tone that is not to contribute is zero; conversely, claim 67 further requires, also relative to claim 65, that the weighting coefficient applied to a tone that is to contribute is one.

Applicants submit that claims 65 through 67 are patentable over the applied references for the reasons discussed above relative to claim 63. Applicants further submit that these claims are further patentable over the applied references for the additional reason that there is no disclosure or suggestion from the references of these additional limitations on the weighting

factors that would lead the skilled artisan to the method of claims 65 through 67. As discussed above, both of the references lack disclosure of "a weighting coefficient for each of the plurality of tones", as required by claim 63. Accordingly, these references necessarily fail to disclose the additional limitation of claim 65 in which each weighting coefficient takes a value corresponding to whether its corresponding tone is to contribute to the comparison result, much less the specific values recited in claims 66 and 67.

Nor is there any suggestion from the prior art to modify the teachings of these references to arrive at claims 65 through 67, nor is there any indication that the skilled artisan would so modify these teachings using his or her ordinary creativity. The absence of this motivation or indication is especially apparent considering that the weighting factors taught by the Jasper et al. reference correspond to a product of amplitudes of temporally adjacent symbols, as described above. There is no suggestion to modify these teachings so that weighting coefficients correspond to whether their associated tones contribute or not to the result, much less in the manner recited in claims 65 through 67.

For these additional reasons, therefore, Applicants submit that claims 65 through 67 are further patentably distinct over the applied references.

Claim 68 further requires, relative to claim 63 upon which it depends, that each weighting coefficient corresponds to the signal-to-noise ratio of its associated tone. In addition to the reasons discussed above relative to claim 63, Applicants submit that the combined teachings of the applied references fall further short of the requirements of claim 68, and that therefore this claim is further patentably distinct over those references.

There is no disclosure or suggestion from either of the applied references to derive the weighting coefficient for each tone based on that tone's signal-to-noise ratio, as claimed. Because the references lack disclosure of "a weighting coefficient for each of the plurality of tones", as required by claim 63, those references necessarily fail to disclose the additional limitation of claim 68 in which the weighting coefficients are based on the tone signal-to-noise ratio. Nor is there any suggestion from the prior art to, or indication that one of ordinary skill and creativity would, modify these teachings so as to reach claim 68, considering the Jasper et al.

teachings that its weighting factors correspond to a product of amplitudes of temporally adjacent symbols, and thus have nothing to do with the attributes of an associated tone (and, in fact, are not even associated with a tone).

For these additional reasons, Applicants submit that claim 68 is further patentably distinct over the references applied against the claims.

Based on this response and the foregoing remarks, Applicants respectfully submit that all claims in this case are in condition for allowance. Favorable consideration of this application is therefore respectfully requested.

Respectfully submitted,
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